



Dam Safety: Ground Cover

The establishment and control of proper vegetation are an important part of dam maintenance. Properly maintained vegetation can help prevent erosion of embankment and earth channel surfaces, and aid in the control of groundhogs and muskrats. The uncontrolled growth of vegetation can damage embankments and concrete structures and make close inspection difficult.

Grass vegetation is an effective and inexpensive way to prevent erosion of embankment surfaces. If properly maintained, it also enhances the appearance of the dam and provides a surface that can be easily inspected. Roots and stems tend to trap fine sand and soil particles, forming an erosion-resistant layer once the plants are well established. Grass vegetation may not be effective in areas of concentrated runoff, such as at the contact of the embankment and abutments, or in areas subjected to wave action.

The purpose of keeping a healthy stand of grass at an appropriate height year round on the embankment and spillway is to: 1) protect the surface from extreme runoff events, 2) create a continuous, stable, near surface soil layer, 3) minimize woody/animal penetrations, 4) allow visual monitoring for early detection of safety deficiencies (seepage, wet spots, cracks, settlement, bulges, misalignment, sloughs, rills, holes, etc.) by the owner, 5) prevent deterioration of the deeper compacted soils of the embankment.

A uniform, vigorous, turf forming grass stand that can tolerate stressful conditions (drought to very wet), survive high flows from runoff, provide protection to the underlying soil and allows for visual inspection of the structure is acceptable. A turf-type tall fescue would be an acceptable seed to use. Other grasses included in the mixture should be suitable for erosion control and steep slopes.

Grasses that are substantially clumpy, extremely deep-rooted, matt, spread or intertwine on the

surface are not acceptable. Extremely deep-rooted grasses may compromise the integrity of the compacted embankment fill. A dense matted grass that creates a tangled mass will hide surface deficiencies and cause difficulty for the owner to routinely inspect and monitor the structure.

Common Problems

Bare Areas

Bare areas on an embankment are void of protective cover (e.g. grass, asphalt, riprap, etc.). They are more susceptible to erosion which can lead to localized stability problems such as small slides and sloughs. Bare areas must be repaired by establishing a proper grass cover or by installing other protective cover. If using grass, the topsoil must be prepared with fertilizer and then scarified before sowing seed. Types of grass vegetation that have been used on dams in Ohio are bluegrass, fescue, ryegrass, alfalfa, clover, and redtop. One suggested seed mixture is 30% Kentucky Bluegrass, 60% Kentucky 31 Fescue, and 10% Perennial Ryegrass. Once the seed is sown, the area should be mulched and watered regularly.

Erosion

Embankment slopes are normally designed and constructed so that the surface drainage will be spread out in a thin layer as "sheet flow" over the grass cover. When the sod is in poor condition or flow is concentrated at one or more locations, the resulting erosion will leave rills and gullies in the embankment slope. The erosion will cause loss of material and make maintenance of the embankment difficult. Prompt repair of the erosion is required to prevent more serious damage to the embankment. If erosion gullies are extensive, a registered professional engineer may be required to design a more rigid repair such as riprap or concrete. Minor rills and gullies can be repaired by filling them with compacted cohesive material. Topsoil should be a minimum of 4 inches deep. The area should then be seeded and mulched. Not only should the eroded areas be

repaired, but the cause of the erosion should be addressed to prevent a continued maintenance problem.



Figure 1 – Rill and gully erosion

Footpaths

Paths from animal and pedestrian traffic are problems common to many embankments. If a path has become established, vegetation in this area will not provide adequate protection and a more durable cover will be required unless the traffic is eliminated. Gravel, asphalt, and concrete have been used effectively to cover footpaths. Embedding railroad ties or other treated wood beams into an embankment slope to form steps is one of the most successful and inexpensive methods used to provide a protected pathway.

Vehicle Ruts

Vehicle ruts can also be a problem on the embankment. Vehicular traffic on the dam should be discouraged especially during wet conditions except when necessary. Water collected in ruts may cause localized saturation, thereby weakening the embankment. Vehicles can also severely damage the vegetation on embankments. Worn areas could lead to erosion and more serious problems. Ruts that develop in the crest should be repaired by grading to direct all surface drainage into the impoundment. Bare and eroded areas should be repaired using the methods mentioned in the above sections. Constructed barriers such as fences and gates are effective ways to limit access of vehicles.

Improper Vegetation

Crown vetch, a perennial plant with small pink flowers, is commonly used on steep slopes to prevent erosion. However, it is not recommended on dams since it hides the embankment surface, thus preventing early detection of cracks and

eroded areas.



Figure 2 – Animal footpaths and vehicular ruts



Figure 3 – Crown vetch

Vines and woody vegetation such as trees and brush also hide the embankment surface preventing early detection of cracks and erosion. Tall vegetation also provides a habitat for burrowing animals. All improper vegetation must be removed from the entire embankment surface. Any residual roots that are larger than 3 inches in diameter must be removed. All roots should be removed down to a depth of at least 6 inches and replaced with a compacted clay material; then 4 inches of topsoil should be placed on the disturbed areas of the slope. Finally, these areas must be seeded and mulched to establish a proper grass cover.

Maintenance

Maintaining a good, thick grass cover on an embankment dam at an appropriate height is one aspect of maintaining and keeping a dam safe. A dam is like any other man-made structure that

creates a hazard; it needs to be maintained for safety and proper performance.

Proper, routine maintenance is essential to keep the "design/spec" grass cover in a healthy condition to obtain the expected performance. Poor care and maintenance allow undesirable grasses, weeds and woody growth to overcome the acceptable grass. To develop good grass cover requires proper establishment and maintenance techniques such as fertilizer applications, mowing, spraying, cutting of brush and reseeding bare spots.

Listed below are some considerations in maintaining the grass cover on the dam and spillway. There may be other site-specific factors that need to be considered.

- Grass on significant or high hazard dams or on dams that are a valuable resource should be mowed, not burned. Burning a dam leaves the surface of the ground exposed to erosion for an extended period of time. Further, burning may overstress the design/spec grass and allow undesirable vegetation to establish. Mowing frequency will depend on what the turf can stand. Mowing just after seed has formed but before maturity will slow the growth of the turf for the rest of the summer. This would allow for good inspection and not cause as frequent of mowing. However, all embankment slopes and vegetated earth spillways should be mowed at least twice a year.
- Mowing to six (6) inches is acceptable if the above item is followed. Mowing off no more than 1/3 of the leaf blade is standard for good turf management. By mowing off more, the turf is stressed and its growth slowed. Care must be taken not to stress the turf unduly by improper maintenance.
- Proper mowing equipment should be used to minimize rutting the slope, reduce damage to the grass, and provide safety for the operator.
- Slope trash (logs, stones, etc.) should be removed and ruts filled with compacted similar soil material to provide a uniform cut and minimize equipment damage and injury to the operator.
- Thick grass clippings or large clumps should be removed to keep the underlying grass from dying.
- After each mowing, the dam owner should thoroughly inspect the dam for deficiencies. If there are new deficiencies or significant changes in previous deficiencies, the dam

owner's engineer and the Division of Water should be contacted.

- Bare spots should be seeded and fertilized. Weeds and woody growth should not be allowed to establish.

Common methods for control of vegetation include the use of weed trimmers or power brush-cutters and mowers. Chemical spraying to kill small trees and brush is acceptable if precautions are taken to protect the local environment. Some chemical spraying may require proper training prior to application. Additional information can be found on the Trees and Brush Fact Sheet.

Any questions, comments, concerns, or fact sheet requests should be directed to the Division of Water at the following address:

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